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09/671,636	09/27/2000	William B. Dress JR.	19867-747	5755

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EXAMINER	
PATHAK, SUDHANSHU C	
ART UNIT	PAPER NUMBER
2634	11

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/671,636	DRESS ET AL.	
	Examiner	Art Unit	
	Sudhanshu C. Pathak	2634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *March 23rd, 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11,15,25,26 and 28-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11,15,25,26 and 28-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *September 27th, 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-to-11, 15, 25-26 & 28-34 are pending in the application.

   Claims 12-14, 16-24 and 27 are canceled without prejudice or disclaimer.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

   A person shall be entitled to a patent unless –

   (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 7, 10, 28 & 32-34 are rejected under 35 U.S.C. 102(b) as being anticipated by Jung-yeol Oh et al. ("The bandwidth efficiency increasing method of multi-carrier CDMA and its performance evaluation in comparison with DS-CDMA with rake receiver", Vehicular Technology Conference, May 16-20, 1999, Pg. 561-565).

Regarding to Claim 1, 10, 28 & 32-34, Oh discloses a method for signal transmission based on the Multi-Carrier CDMA (MC-CDMA), which is further based on a combination of Direct-Sequence (DS-CDMA) and orthogonal frequency division multiplexing (OFDM) (Introduction, Pg. 561, lines 1-6). Oh further discloses that the technique to transmit data on multiple parallel streams that are modulated on different subcarriers which are orthogonally spaced to each other (Introduction, Pg. 561, lines 7-10). Furthermore, Oh disclose that the overlapping plurality of spread-spectrum signals have carrier frequencies that are an integral multiple of the data symbol rate (The concept of MC-CDMA, Pg. 562, lines 5-8 & Fig. 4, Equ. 10). Oh

also discloses a scheme that transmits only the half of symbol during one symbol duration and the subcarrier spacing is an integral sub-multiple of the data symbol rate (Fig. 8(b), Pg. 564), Oh further discloses this sub-multiple to be one-half the data symbol rate (Fig. 5, Pg. 563). Oh discloses a multi-carrier CDMA system employing a combination of CDMA and OFDM (Introduction, Pg. 561, lines 1-10) wherein a multiple users could transmit the same one of the said plurality of DS-CDMA signals but with orthogonal PN-sequence as in a CDMA system, so as to retransmit on of plurality of DS-CDMA signals but a different PN sequence (Fig. 6 & Equ. 9, Pg. 563).

Regarding to Claim 7, Oh discloses that the data bits are converted from a serial-to-parallel format before synchronously allocating each of the plurality of users to one of a plurality of orthogonal channels (The concept of MC-CDMA, Pg. 561, lines 10-11 & Fig. 1, Fig. 3, Fig. 6).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 2, 3, 6 & 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jung-yeol Oh et al. ("The bandwidth efficiency increasing method of multi-carrier CDMA and its performance evaluation in comparison with DS-CDMA with rake receiver", Vehicular Technology Conference, May 16-20, 1999, Pg. 561-

565) in view of Li Enjia et al. ("The study of FH/MCFD/SSMA/DPSK wireless communications system", International Conference on Communications Technology, ICCT'98, Oct. 22-24, 1998, Pg. S18-06-1 – S18-06-5).

Regarding to Claims 2, 3 & 6, Oh discloses a method for signal transmission based on the Multi-Carrier CDMA (MC-CDMA), which is further based on a combination of Direct-Sequence (DS-CDMA) and orthogonal frequency division multiplexing (OFDM) (Introduction, Pg. 561, lines 1-6) as described above. However, Oh does not specify the encoding of data bits of the said plurality of direct-sequence spread-spectrum signals.

Enjia discloses a scheme of frequency-hopping/multiple-carrier frequency-diversity spread-spectrum multiple-access (FH/MCFD/SSMA/DPSK) wireless communication system (Abstract, lines 1-3). Enjia further discloses differentially encoding the data bits before frequency hopping or PN-spreading the data (Fig. 1(a), Page S18-06-3 & Equ. 1, Page S18-06-4). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that by implementing the differential encoder as described in Enjia into the MC-CDMA system describe by Oh the data bits would be further protected from channel interference thus providing a more reliable communications link.

5. Claims 4 & 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jung-yeol Oh et al. ("The bandwidth efficiency increasing method of multi-carrier CDMA and its performance evaluation in comparison with DS-CDMA with rake

receiver", Vehicular Technology Conference, May 16-20, 1999, Pg. 561-565) in view of Haines (5,469,469).

Regarding to Claims 4 & 9, Oh discloses a method for signal transmission based on the Multi-Carrier CDMA (MC-CDMA), which is further based on a combination of Direct-Sequence (DS-CDMA) and orthogonal frequency division multiplexing (OFDM) (Introduction, Pg. 561, lines 1-6) as described above. However, Oh does not specify the frequency-hopping modulation is performed in a continuous-phase manner, the overlapping of the signal transmission to include establishing a bit-clock synchronization and the method further comprising multiplying an incoming signal by an estimate of the desired signal and integrating over an integral multiple of the bit period.

Haines discloses a CDMA (spread-spectrum) modulator and demodulator using plurality of frequencies and chipping code (Abstract, lines 1-14). Haines further discloses selecting a chipping sequence from among a plurality of orthogonal sequences, and further comprising a phase shift key dimension on orthogonal subcarriers (Abstract, lines 1-14 & Column 2, lines 62-67). Furthermore, Haines discloses that any linear modulation techniques such as continuous phase modulation can be used in the DS-CDMA in combination with other techniques (Column 3, lines 17-25). Haines also discloses the overlapping to include establishing a bit-clock synchronization (Fig. 4, element "bit rate clock" & Fig. 8) and the method further comprising multiplying the incoming signal by an estimate of the desired signal and integrating the product (Fig. 5A, C & Fig. 6 & Column 1, lines 64-

67 & Column 2, lines 50-67 & Column 3, lines 16-25 & Column 5, lines 5-19). Therefore, it would have been obvious for one of ordinary skill in the art at the time of the invention that implementing a frequency-hopping modulation is continuous-phase manner in the system as described by Oh would greatly simplify the synchronization and receiving of the transmitted MC-CDMA signal in the receiver, thus reducing the complexity of the receiver and the synchronization of the bit clock can be used to synchronize the PN sequence with the data.

6. Claims 5, 30 & 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jung-yeol Oh et al. ("The bandwidth efficiency increasing method of multi-carrier CDMA and its performance evaluation in comparison with DS-CDMA with rake receiver", Vehicular Technology Conference, May 16-20, 1999, Pg. 561-565) in view of Azad et al. ("Multirate Spread Spectrum Direct Sequence CDMA techniques", IEE Colloquium on Spread Spectrum Technique, 15 April, 1994, Pg. 4/1-4/5).

Regarding to Claims 5, 30 & 31, Oh discloses a method for signal transmission based on the Multi-Carrier CDMA (MC-CDMA), which is further based on a combination of Direct-Sequence (DS-CDMA) and orthogonal frequency division multiplexing (OFDM) (Introduction, Pg. 561, lines 1-6) as described above. However Oh does not specify the system comprising time hopping encoding the plurality of DS-CDMA signals.

Azad discloses a multiple access schemes in regards to DS-CDMA wireless system to support a high quality of service and data rates depending on the desired

applications (Introduction, Pg. 4/1, lines 1-24). Azad further discloses a (TDM/CDMA) wherein a frame is divided into several time slots and then the signals, which have been spread, are transmitted during these time slots, thus time-hopping encoding said plurality of DS-spread spectrum signals (TDM/CDMA, Pg. 4/2, lines 1-11). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that to encode the DS-spread spectrum signals of the system disclosed in Oh, by the scheme described in Azad would expand the channel capacity of the system. Furthermore by combining the OFDM (FH) as disclosed in Oh and the time-hopping as disclosed in Azad would further increase the channel capacity and minimize the interference per channel.

7. Claim 8, 25 & 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jung-yeol Oh et al. ("The bandwidth efficiency increasing method of multi-carrier CDMA and its performance evaluation in comparison with DS-CDMA with rake receiver", Vehicular Technology Conference, May 16-20, 1999, Pg. 561-565) in view of Yun (6,243,397).

Regarding to Claim 8, Oh discloses a method for signal transmission based on the Multi-Carrier CDMA (MC-CDMA), which is further based on a combination of Direct-Sequence (DS-CDMA) and orthogonal frequency division multiplexing (OFDM) (Introduction, Pg. 561, lines 1-6) as described above. However, Oh does not specify encoding a frequency shift in a subset of bits that compose a code word.

Yun discloses a parallel combinatory code division multiple access (PC-CDMA) system that transmits data by applying a predetermined PN code corresponding to a

plurality of data bits in a multi-carrier (MC-) CDMA wireless system (Abstract, lines 1-5). Yun discloses a system comprising a plurality of mappers for converting a plurality of data bits into PN codes corresponding to the data values to spread the transmitting data further corresponding to frequency signals to transmit the CDMA signals (Column 2, lines 53-67 & Fig. 3(a) & Column 4, lines 25-63). Therefore, it would be obvious to one of ordinary skill in the art at the time of the invention that it is possible to group the bits from the serial-to-parallel as described in Yun, into the system as described in Oh, and encode the frequency shift in a subset of bits that compose a PN code word thus satisfying the limitation of the claim.

Regarding to Claim 25 & 26, Oh discloses a method for signal transmission based on the Multi-Carrier CDMA (MC-CDMA), which is further based on a combination of Direct-Sequence (DS-CDMA) and orthogonal frequency division multiplexing (OFDM) (Introduction, Pg. 561, lines 1-6) as described above. However Oh does not disclose a computer program and a computer-readable medium for implementing the steps for overlapping a plurality of DS-CDMA signals using carrier frequencies that are orthogonally spaced relative to the integral multiple of a bit rate when the said program is run.

Yun discloses a parallel combinatory code division multiple access (PC-CDMA) system that transmits data by applying a predetermined PN code corresponding to a plurality of data bits in a multi-carrier (MC-) CDMA wireless system (Abstract, lines 1-5). Yun also discloses the system to comprise a digital signal processor (DSP) and a storing medium for storing the PN-code data and for generating a plurality of

frequency signals for frequency modulation orthogonal relative to an integral data symbol through an algorithm (Column 3, lines 1-11 & Column 5, lines 17-33). Therefore, it would be obvious to one of ordinary skill in the art at the time of the invention was made to implement the algorithm for overlapping a plurality of DS-CDMA signals using carrier frequencies that are orthogonally spaced relative to the integral multiple of a bit rate as described in Oh on a DSP and store the algorithm in the storing means as described in Yun so as to have the system run independently, continuously and on on-demand basis for all the signals to be transmitted within the communication system.

8. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jung-yeol Oh et al. ("The bandwidth efficiency increasing method of multi-carrier CDMA and its performance evaluation in comparison with DS-CDMA with rake receiver", Vehicular Technology Conference, May 16-20, 1999, Pg. 561-565) in view of Natali (5,623,487).

Regarding to Claim 11, Oh discloses a method for signal transmission based on the Multi-Carrier CDMA (MC-CDMA), which is further based on a combination of Direct-Sequence (DS-CDMA) and orthogonal frequency division multiplexing (OFDM) (Introduction, Pg. 561, lines 1-6) as described above. However, Oh does not specify implementing an error-correction code on the DS-CDMA signal.

Natali discloses a orthogonal code, multi-carrier CDMA wireless system providing at least one base station and a plurality of subscriber terminals, employing orthogonal code and additional carriers with orthogonal frequency spacing for

additional capacity producing a doubly orthogonal code and FDMA communication system (Column 2, lines 30-42). Natali further discloses employing forward error correction (FEC) and interleaving in the doubly orthogonal FDMA communication depending on the application (Column 3, lines 4-10). Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention that implementing the forward error correction as described in Natali in the MC-CDMA system as described in Oh would maintain the integrity of the data transmitted in undesirable channel conditions by providing a more reliable communication link between the base station and the subscriber terminals.

Response to Arguments

9. Applicant's arguments filed on March 19th, 2004 have been fully considered but they are not persuasive.

In regards to the arguments presented regarding Claims 1, 7, 10, 28 & 32-34, Oh discloses a method for signal transmission based on the Multi-Carrier CDMA system (MC-CDMA) (Introduction, Pg. 561, lines 1-6 & Abstract, Pg. 561, lines 1-13). Furthermore, a CDMA system comprises a multiple access scheme for transmission / reception of multiple direct-sequence spread spectrum signals (DS-SS) simultaneously. Oh also discloses that the MC-CDMA method of transmission is based on a technique wherein the data stream is modulated and transmitted at different subcarriers which are orthogonal to each other (Introduction, Pg. 561, lines 7-10 & Fig.'s 4-6). Oh further discloses the carrier frequencies being orthogonally spaced relative to an integral multiple of a bit rate rather than the chip rate (The

Concept of MC-CDMA, Pg. 562, Eq. 1 & Pg. 563, lines 1-7 & Fig.'s 4-5, 8 & Pg. 563, Section IV, lines 1-25). **Note that the rejections are based on the limitations recited in the claims, and based on the above rationale, the rejections are maintained.**

In regards to the arguments presented regarding Claims 2, 3, 6 & 29, Oh discloses a method for signal transmission based on the Multi-Carrier CDMA (MC-CDMA), wherein a CDMA system comprises a multiple access scheme for transmission / reception of multiple direct-sequence spread spectrum signals (DS-SS) simultaneously as explained above. Enjia discloses a scheme of frequency-hopping/multiple-carrier frequency-diversity spread-spectrum multiple-access (FH/MCFD/SSMA/DPSK) wireless communication system (Abstract, lines 1-3). Furthermore, Enjia discloses a spread spectrum multiple access (SSMA) that can be classified into four types DS/SSMA, FH/SSMA, TH/SSMA and MCFD/SSMA (Introduction, Pg. S18-06-1, lines 1-9), and it is possible to compose a hybrid scheme combining DSSS with TH and FH so as to increase the channel capacity of a communication system and to minimize interference. Enjia further discloses differentially encoding the data bits before frequency hopping or PN-spreading the data (Fig. 1(a), Page S18-06-3 & Equ. 1, Page S18-06-4). **Note that the rejections are based on the limitations recited in the claims, and based on the above rationale, the rejections are maintained.**

In regards to the arguments presented regarding Claim 4, Oh discloses a method for signal transmission based on the Multi-Carrier CDMA (MC-CDMA), wherein a

CDMA system comprises a multiple access scheme for transmission / reception of multiple direct-sequence spread spectrum signals (DS-SS) simultaneously as explained above. Haines discloses a CDMA (spread-spectrum) modulator and demodulator using plurality of frequencies and chipping code (Abstract, lines 1-14). Haines further discloses selecting a chipping sequence from among a plurality of orthogonal sequences, and further comprising a phase shift key dimension on orthogonal subcarriers (Abstract, lines 1-14 & Column 2, lines 62-67). Furthermore, Haines discloses that any linear modulation techniques such as continuous phase modulation can be used in the DS-CDMA in combination with other techniques (Column 3, lines 17-25). **Note that the rejections are based on the limitations recited in the claims, and based on the above rationale, the rejections are maintained.**

In regards to the arguments presented regarding Claims 5 & 30-31, Oh discloses a method for signal transmission based on the Multi-Carrier CDMA (MC-CDMA), wherein a CDMA system comprises a multiple access scheme for transmission / reception of multiple direct-sequence spread spectrum signals (DS-SS) simultaneously as explained above. Azad discloses a multiple access schemes in regards to DS-CDMA wireless system to support a high quality of service and data rates depending on the desired applications (Introduction, Pg. 4/1, lines 1-24). Azad further discloses a (TDM/CDMA) wherein a frame is divided into several time slots and then the signals, which have been spread, are transmitted during these time slots, thus time-hopping encoding said plurality of DS-spread spectrum signals

(TDM/CDMA, Pg. 4/2, lines 1-11). **Note that the rejections are based on the limitations recited in the claims, and based on the above rationale, the rejections are maintained.**

In regards to the arguments presented regarding Claims 8 & 25-26, Oh discloses a method for signal transmission based on the Multi-Carrier CDMA (MC-CDMA), wherein a CDMA system comprises a multiple access scheme for transmission / reception of multiple direct-sequence spread spectrum signals (DS-SS) simultaneously as explained above. Yun discloses a parallel combinatory code division multiple access (PC-CDMA) system that transmits data by applying a predetermined PN code corresponding to a plurality of data bits in a multi-carrier (MC-) CDMA wireless system (Abstract, lines 1-5). Yun discloses a system comprising a plurality of mappers for converting a plurality of data bits into PN codes corresponding to the data values to spread the transmitting data further corresponding to frequency signals to transmit the CDMA signals (Column 2, lines 53-67 & Fig. 3(a) & Column 4, lines 25-63). Yun further discloses a parallel combinatory code division multiple access (PC-CDMA) system that transmits data by applying a predetermined PN code corresponding to a plurality of data bits in a multi-carrier (MC-) CDMA wireless system (Abstract, lines 1-5). Yun also discloses the system to comprise a digital signal processor (DSP) and a storing medium for storing the PN-code data and for generating a plurality of frequency signals for frequency modulation orthogonal relative to an integral data symbol through an algorithm (Column 3, lines 1-11 & Column 5, lines 17-33). **Note that the rejections**

are based on the limitations recited in the claims, and based on the above rationale, the rejections are maintained.

In regards to the arguments presented regarding Claim 11, Oh discloses a method for signal transmission based on the Multi-Carrier CDMA (MC-CDMA), wherein a CDMA system comprises a multiple access scheme for transmission / reception of multiple direct-sequence spread spectrum signals (DS-SS) simultaneously as explained above. Natali discloses a orthogonal code, multi-carrier CDMA wireless system providing at least one base station and a plurality of subscriber terminals, employing orthogonal code and additional carriers with orthogonal frequency spacing for additional capacity producing a doubly orthogonal code and FDMA communication system (Column 2, lines 30-42). Natali further discloses employing forward error correction (FEC) and interleaving in the doubly orthogonal FDMA communication depending on the application (Column 3, lines 4-10). **Note that the rejections are based on the limitations recited in the claims, and based on the above rationale, the rejections are maintained.**

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sudhanshu C. Pathak whose telephone number is (703) 305-0341. The examiner can normally be reached (Monday-Friday from 8:30 AM to 5:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin, can be reached at (703) 305-4714.

Any response to this action should be mailed to:

- Commissioner of Patents and Trademarks Washington, D.C. 20231

Or faxed to:

- (703) 872-9314 (for Technology Center 2600 only)

Hand-delivered responses should be brought to:

- Crystal Park II, 2121 Crystal Drive, Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to:

- Technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

STEPHEN CHIN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600